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THE PRINCETON UNIVERSITY BULLETIN



A QUARTERLY RECORD EDITED BY
THE PRESIDENT AND MEMBERS OF THE FACULTY

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EDITED BY THE PRESIDENT AND MEMBERS OF THE FACULTY.

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No. 1.

PRELIMINARY NOTES ON THE WHITE RIVER CANIDÆ.

By W. B. SCOTT.

The phylogeny of many hoofed animals, such as the horses, rhinoceroses, camels, &c., has been satisfactorily determined by means of the numerous and beautifully preserved fossils which have been found in the ancient lacustrine deposits of the West. To work out the descent and mutual relationships of the various families of Carnivora is a much more difficult task, in which hardly a beginning has been made. The principal difficulty lies in the comparative rarity of the Carnivora as fossils and in the still greater rarity of reasonably complete specimens of them. Many genera, which were named half a century ago, are still very inadequately known, and the materials for a more complete knowledge of them accumulate very slowly as compared with the wealth of the hoofed mammals.

In the season of 1896, Mr. J. W. Gidley had the good fortune to collect quite an extensive series of the primitive and highly interesting White River dogs, material which throws much welcome light upon the origin of the *Canidæ* and their relationship to the other carnivorous families.

Already in the uppermost Eocene, or Uinta stage, we find two distinctly separated lines of the *Canidæ*, represented by

species which cannot, as yet, be distinguished generically from the White River *Daphænus* and *Cynodictis*. The latter genus is also found in strata of corresponding age in Europe, the gypsum beds of Montmartre.

The material collected by Mr. Gidley belongs principally to *Daphænus*, a genus which has hitherto been known only from a few very imperfect skulls, but of which nearly all parts of the skeleton are now represented in one or other specimen. Many of the facts of structure thus revealed are of a very unexpected character.

The dental formula of *Daphænus* is $I_{\frac{3}{3}} C_{\frac{1}{1}} P_{\frac{4}{4}} M_{\frac{3}{3}}$, indicating a greater number of teeth than in any other known member of the family except *Otocyon* and *Amphicyon*. Except for the small size and primitive structure of the sectorial teeth, which resemble those of Creodonts, there is no peculiarity in the dentition which requires special description. The skull is remarkable for the elongation of the cranium and zygomatic arches and the relative shortness of the face, which is another creodont feature. The elongation of the cranium is not due to an enlargement of the cerebral hemispheres, which are much smaller and more simply convoluted than in the recent *Canidæ*, but to the large size of the cerebellar and olfactory fossæ. The post-orbital constriction, which marks the anterior boundary of the hemispheres, is

placed very far behind the orbits, as in other primitive carnivores and in the creodonts. The auditory bulla is very small and consists of a single chamber, the tympanic, without tubular auditory meatus. The posterior chamber of the bulla was either entirely absent or was not ossified, and, in consequence, there is a large fossa behind the bulla, bounded superiorly by the periotic. The frontals, in spite of their almost level course, contain large sinuses, thus allying the genus to the Thooid (wolf) rather than to the Alopecoid (fox) series of the *Canidæ*. The mandible is non-lobate and the horizontal ramus straight and slender, except in the new species, ? *D. robustus*, from the Titanotherium beds, which is somewhat doubtfully referred to the genus.

The vertebral column is remarkable, and, curiously enough, displays a closer resemblance to that of the cats than to that of the dogs. For example, the vertebralarterial canal of the atlas perforates the transverse process from behind instead of from above. The thoracic vertebræ appear to number thirteen and are relatively small, but have well developed neural spines. The lumbar, of which there were probably seven, resemble those of the cats in the great length of the neural spines and in the prominence of the metapophyses and anapophyses. The sacrum consists of three vertebræ, and is relatively much larger and stouter than in the recent dogs. The tail is much longer and thicker than in any modern representative of the *Canidæ*, strongly resembling that of the larger cats, such as the leopard, for example. The caudal vertebræ are remarkably elongate, and the anterior ones have very well developed processes. The contemporary Machairodont, *Hoplophoneus*, has a similar tail, but the individual vertebræ are shorter and heavier.

The humerus is extraordinarily cat-like in character. This is to be seen in the

great prominence and length of the deltoid and supinator ridges, in the low, wide trochlea, in the very large and heavy internal epicondyle, and in the very large epicondylar foramen. The bones of the fore-arm are not less feline in appearance. The radius has an almost discoidal head, which shows that the animal possessed the power of freely rotating the hand. The distal end of the radius and the whole ulna are very unlike those of the dogs and resemble those of the cats, and especially of the Machairodont division or sub-family. In the carpus the scaphoid and lunar have coalesced into a single bone, which is unusually low. The metacarpals, five in number, are very short in proportion to the size of the animal, and have not at all the parallel arrangement and quadratic section which characterize the recent *Canidæ*, but rather resemble the divergent arrangement found in the larger Mustelines.

The pelvis differs from that of *Canis* chiefly in its greater elongation and especially in the elongation of the ischium and consequent enlargement of the obturator foramen. The femur is long and quite stout, with very prominent greater and lesser trochanters. Whether a third trochanter was present cannot be determined from the available material, though it probably was. The rotular trochlea resembles that of the cats in being broad and shallow and in having only moderately elevated borders. The tibia is short and rather slender and has a cnemial crest of only moderate prominence; its distal end is much like that of such primitive Machairodonts as *Dinictis* in the shallowness of the astragalar facets and in the very large size of the internal malleolus. The fibula, though slender, is much stouter and less reduced than in *Canis*, and its distal end is cat-like. The tarsus is almost as much like that of *Dinictis* as like that of *Canis*, though the astragalus is somewhat

more deeply grooved than in the former. The metatarsals, five in number, are longer and more slender than the metacarpals, and the hallux is well developed. The phalanges are of a very unexpected nature; those of the second row are somewhat asymmetrical and slightly excavated or depressed upon the fibular side, showing that the claws were at least partially retractile. The ungual phalanges are sharper and more compressed than in *Canis* and have larger bony hoods around their bases.

The structure of the feet leads us to infer that the gait was not digitigrade, but was either plantigrade or semi-plantigrade.

The ancestry of *Daphænus* is as yet far from clear. A closely allied, if not identical genus occurs in the Uinta Eocene, but the Bridger representative of the group has not yet been determined positively. There is much reason to believe, however, that the Bridger creodont *Miacis bathygnathus* will, when better known, prove to be the desired form. On the other hand, it is altogether probable that *Daphænus* should have a place in the true phylogenetic series of the *Cunidae*. From it two lines may be traced, one leading to the curiously specialized John Day genera, *Temnocyon* and *Hypotemnodon*, the other through *Cynodesmus* of the John Day to *Canis*.

Puzzling and unexpected are the many cat-like features of structure which we find in *Daphænus* and which are found in so many different parts of the skeleton that that they can hardly be the results of convergence. These resemblances would seem to indicate that the cats do not occupy so isolated a position among the Carnivores as has been supposed, but that they have a common origin with the primitive dogs from some ancestor which still remains to be discovered in the middle or lower Eocene.

THE GIANT GANGLION-CELLS IN THE SPINAL CORD OF THE ORDER HETEROSOMATA OF FISHES.

By ULRIC DAHLGREN.

The following is an outline of the scope and aim of a paper by the writer in a contemporary number of the *Anatomische Anzeiger* of Jena.

As early as 1885, VICTOR ROHON of Germany described a series of large nerve cells which appeared in the dorsal median fissure of the young trout's spinal cord. And he also determined the fact that these cells with their processes atrophied at a very early stage of the fish's life, about at the time of hatching. He was unable to follow, with certainty, any of the processes of these cells and consequently could not even guess at their function as a part of the nervous system.

Since that time a number of papers have been published describing a similar larval apparatus in the embryos and larvae of many other fishes, and even of some Amphibians.

BEARD has described most carefully identical giant cells in the embryos of *Raja* and has worked out in part the distribution of their *neurites* or nerve processes. But he has not determined their final distribution or even decided if they are motor or sensory types of cells. And he has published a volume to show that an antithetic alternation of generation exists among the vertebrated animals, while his main and only argument in support of this theory lies in the belief that this giant ganglion cell apparatus is *always* a larval or embryonic structure which fact the present paper will show to have no basis for its existence. BEARD has also mentioned or described briefly this same apparatus in *Rhodeus*, *Lepidosteus*, *Labrax*, etc. STUDNICKER of Bohemia has published recently a very able and accurate contribution to the history of the giant

cell apparatus as found in the young of many fishes and amphibians, while many other writers have published articles which show that this peculiar larval structure is very general among the fishes and quite so among the amphibians. Still others have described groups of cells which belong but doubtfully or not at all to this class.

But one Neurologist has found this apparatus in the adult. GUSTAVE FRITSCH of Germany found and described it in the angler, *Lophius*. But he failed to recognize its connection with the larval apparatus. BEARD touches on this connection but only admits that the apparatus described by FRITSCH may be a development of the larval giant ganglion cell. With the literature on the subject in this stage the writer discovered and describes the existence of a remarkably well developed giant ganglion cell apparatus in the adult of all the *Heterosomata* or at least in so many genera of this order that little doubt can exist that it will be found in all. The cells were located and studied in embryonic and larval flat fishes and traced in their development to the

adult form where it was found that they formed a single row of enormous nerve cells in the posterior fissure and that each cell gave rise to a nerve process which passed ventrad into the cord and then joined either one or the other of two symmetrically placed fibre tracts lying on either side of the central canal. In this tract the nerve fibre passes caudad and it was not possible to follow it further.

The studies on this apparatus have since been pushed further and with the aid of other methods it has been found that the neurite bifurcates a short distance from the cell and while one branch passes caudad in the bundle, the other passes further ventrad and probably does not enter the bundle at all. Also the same apparatus has been discovered in two other species of fishes not members of the order *Heterosomata*, i. e. *Batrachus tau* and *Hemitripterus Americanus*.

Work has been begun on an exhaustive scale on the larva of *Noturus flavus* in which it is believed that the apparatus atrophies before hatching and it is intended to study it particularly in the life history of *Batrachus* in which it exists throughout life.

ABSTRACTS OF PAPERS READ.

TWO CURRENT FALLACIES IN THE HIGHER CRITICISM.

By CHARLES W. SHIELDS.

The Bible considered as a divine revelation is infallible; but the human interpretation of it is often fallacious. Two general fallacies are now current as to its form and its scope.

The first is the dictum that the Bible is mere literature to be studied like other books. This is true, but not the whole truth.

(1) Although the Holy Scriptures resemble the productions of literary art in some respects, this mere formal resem-

blance does not extend to the revealed content and purport. The poet and the philosopher can only voice the common human heart and reason, while the prophet and apostle claim to bring us divine ideas in inspired words, and thus to make known the otherwise unknowable. To read David as we would read Shakespeare, and Paul as we would read Plato is as unphilosophical as it is irreverent. The first chapter of Job treated as mere literature by the dramatist Goethe becomes a travesty in which Mephistopheles appears as a sort of court-fool to the Almighty.

(2) Although the literary appliances of the higher criticism are requisite in studying the Hebrew and Greek Scriptures, as in studying of the Greek and Latin classics, yet not less requisite is that inward divine illumination, that spiritual discernment without which the revealed mind of God cannot be understood and appreciated. While the devout student finds eternal life in the original Scriptures the rationalistic critic is reducing them to a set of Hebraic myths and Christian legends. A little child is greater in the kingdom of God than he.

The other current fallacy is the dictum that the Bible was designed exclusively to teach religion and morals and teaches nothing else. This reasoning is false in its premise, in its process, and in its product.

(1) Its premise is a masked pre-judgment as to the aim and scope of divine revelation. If we could know a priori what the Bible should teach us and how it should teach us, we would need no Bible at all, and might soon prove the one we have not worth having. Whether geological truth is taught in the first chapter of Genesis, as well as theological truth in the first chapter of St. John, is not properly a question of Introductory Criticism, but of the exegesis of the Canonical Scriptures.

(2) The fallacy proceeds by a faulty exegesis, culling certain portions of Holy Scripture supposed to be purely religious and moral, or theological and ethical, and then rejecting all the remainder as superfluous or erroneous, because astronomical, geological, anthropological or historical in its bearing. No such discrimination is made by the inspired writers themselves; nor can it be made by any devout exegete. Logically we are as much bound by the geological teaching of Moses as the theological teaching of Paul, even though we should like neither, or think one less important than the other. As a matter of fact each is important in its own place,

and they are so implicated that they must stand or fall together.

(3) The fallacy issues in a mutilated Bible with a train of cumulative evils. We may err by seeking too little as well as too much in the word of God. Time was when the latter error prevailed, and the Bible was claimed as the fountain of all philosophy ancient and modern, with its Mosaical Mathematics, its Biblical Physics, Scripture Geology, as well as Christian Politics, Ethics and Theology. Revealed religion then suffered from a forced alliance with false science and superstition. But since the Reformation men have been finding too little in the Bible. The springs of all philosophy are now sought in the unaided reason alone. Great Christian thinkers no longer feel their intellectual need of a divine revelation in framing their theories of knowledge, or systems of science, as they feel their spiritual need of it in moulding their faith and practice. The result is, not only that the physical sciences are detached from Holy Scripture and arrayed against it, but we already have a naturalistic ethic and a comparative theology without miracle and without revelation. Even our popular preachers are discoursing on the errors and myths of the Bible as if it were as antiquated as the oracle or the augury amid the decaying culture of Greece and Rome.

The truth is to be sought between these rash extremes. The Bible is not anti-scientific, because non-scientific; and it is no more non-scientific in the sphere of physical truth than in the sphere of spiritual truth. Its theology is as non-scientific as its astronomy. In fact, it is more in harmony with modern astronomy than with modern theology. It reveals a due metaphysical complement of all the empirical sciences, and may yet be devoutly recognized as a radiant sun of divine knowledge throughout the whole realm of philosophy.

THE GOETHE AND SCHILLER ARCHIVES.

By H. C. O. HUSS.

Goethe's literary relics remained in the possession of his descendants until the last of these, Walther von Goethe who died in the year 1885, bequeathed them to the Grand Duchess of Weimar. An examination of these treasures, which had lain buried for over fifty years, led to the discovery of many precious manuscripts such as Goethe's diaries, the first MS. of Götz von Berlichingen, the MSS. of Werther's Sorrows, the Roman Elegies, Tasso and the final copy of the second part of Faust. The Grand Duchess had this immense collection removed from the Goethe house to her own palace, where until the year 1889 it was known as the Goethe Archives. In this year the same lady became the recipient of another magnificent gift consisting of the entire literary relics of Schiller, which after the poet's death had been removed to southern Germany and were now donated to her by his descendants. She had them incorporated in the Goethe Archives and this title changed to that of Goethe and Schiller Archives. Now under the operation of the law of gravitation other classics were added, such as Herder, Wieland, Klopstock, Gellert, Körner, Platen, Chamisso, Rückert, etc. A large collection of letters written by poets of the Romantic School—Novalis, Tieck, A. W. Schlegel, Clemens and Sophie Brentano—were acquired by purchase. Modern writers were also admitted. The first of these were Auerbach and Heyse. They were followed by Gottfried Keller, Geibel, Theodor Storm, Scheffel, Fritz Reuter and others. New additions being constantly made, partly by donation, partly by purchase, the new handsome and dignified building in Weimar to which these archives were trans-

ferred last year will soon become the mausoleum, as it were, of all the leaders in German literature, a monument of grateful recognition to the past and an inspiration for the future.

[Abstract of a paper read before the Modern Language Club of Princeton University.]

CONNECTION BETWEEN SCULPTURE AND ARCHITECTURE.

By ARTHUR L. FROTHINGHAM, JR.

There has always been a close connection between sculpture and architecture. Some critics, like Ruskin, even go so far as to define architecture as decorative construction; but this is going too far, as it entirely overlooks the artistic value of the constructive forms of architecture and the fact that the proper connection between the two arts involves the subordination of sculpture to architectural lines.

A review of the history of the connection between the two arts is extremely instructive for artists in the present time, as it shows many defects to be avoided as well as themes to be studied.

In Egypt sculpture in relief played no important part in decoration, because when sculpture was used on the walls of the temples it was usually in the form of incised outline figures which had the flat effect of monochromes and were without reality or solidity. The only effective combination seems to have consisted in the placing of colossal figures of kings or animals on the outside of the temple walls.

The Assyrians scored a great advance and developed low-relief in wall decoration to a point of perfection that equalled the later use of it by the Greeks and, as the Egyptians did in the low-reliefs of their tombs, they made great use of polychromy in bringing out the details of both figures and ornamentation. They

also showed a more sculptureque sense in the distribution and composition of the reliefs.

The Dorians and Ionians each contributed distinct elements to Greek sculpture in its relation to architecture. Gable sculptures, whether developed from highly colored terracottas or stone groups or from Dorian bronzes of the archaic period, developed side by side with the reliefs of the metopes which in the classic period of Greek art were inspired by models of the Ionian schools of Asia Minor which were themselves influenced by Assyrian art. During the IV and V centuries B. C. the use of sculpture in connection with architecture was carried to as great an extent as was consistent with the restrained nature of Greek art. This restraint becomes less evident during the close of the IV century when the increase of dramatic intensity gives at times to temple sculptures a restlessness that somewhat detracts from the stability and repose which characterized Greek art at its best.

Roman designers or rather Greek artists in the service of Rome, invented several types of monuments in which the architectural form serves mainly to show off groups of sculpture. Such were the commemorative columns with their spiral reliefs and the richer forms of the triumphal arch. But, on the other hand, the Romans appeared to have lost the true idea of the use of sculpture in subordination to architecture, for we find that their temples no longer have the wealth of gable sculpture, of friezes and metopal reliefs which characterized the Greek temples.

Passing over the period of Early Christian architecture, which gives no suggestive material, we find that in the V and VI centuries A. D. the Syrian and Byzantine schools both give excellent models of decorative sculpture, while they do not attempt to employ figured sculpture, in connection with architecture. The original

and bold treatment of vegetable and natural forms by the Syrians seems almost an anticipation of Gothic work, while the low relief decoration in Byzantine churches, with their lacelike patterns, leaves intact the architectural outlines—an extremely valuable quality in such work.

The revival of sculpture in the XI century, after a gap of about 500 years, was largely in the direction of reuniting figured sculpture to architecture, from which it had been divorced since the Roman period. The general scheme was excellent, but in its details the purely decorative work was by far the best because in the XI and XII centuries sculpture had attained but little technical perfection in the treatment of figures. It was, therefore, left to the Gothic sculptors of the XIII century, to carry to its perfection an ideal scheme for the connection between the two arts. If we have any criticism to make, it is perhaps that sculpture leaned as much too far toward profuseness and freedom as during the best period of Greek art it had remained too closely subjected to the lines of architecture. It is in the monuments of the first half of the XIII century, such as the cathedrals of Paris, of Amiens, Rheims and Chartres, that we see the most perfect examples of the style. It must not be forgotten that the thousands of figures which decorated the great Gothic cathedrals were not executed by the whim of individual artists, but were arranged according to a definite system — an encyclopaedia of human knowledge. It was an attempt to represent in sculpture a summary of the knowledge of the period regarding God, man and the universe from the creation to the Last Judgment, and the architecture of the cathedral was a framework for this immense object-lesson for the use and instruction of the great mass of the people.

The Renaissance proceeded from a country—Italy—which had never estab-

lished the systematic connection between the two arts which we find in the north of Europe. Furthermore, the spirit of the Renaissance was an individualism which was opposed to great systems and to the dependence of artists upon ecclesiastical authorities. It was mainly for these two reasons that the connection between the two arts was less clear and satisfactory during this period. During the early Renaissance, the fascinating system of decorative work in low-relief, with which we are all familiar, was adapted from Greek and Roman models, but during the developed Renaissance ideas of proportion and proper relation were apparently lost and details were magnified to a colossal size, as we see in the interior of St. Peter's in Rome.

We Americans are more broad than any other nation in our study and adaptation of earlier forms of art, and we have the power of assimilation which makes it possible for us to remodel to our use the forms of sculpture in connection with architecture which we judge to have been successfully used in past styles. At the same time, we must avoid indulging in what is our chief defect—lack of purity of style—and we must be careful that our artists do not confine themselves to making the sketches and plans for their work, but see that it is carried out by hands as skilful as those of former ages, instead of by the mechanical, commonplace hands which are allowed to execute most of the modern detailed work.

Summary of a lecture delivered in New York, March 3d, before the Architectural League in the Fine Arts Building.

ETRUSCAN AND OTHER RECENT EXCAVATIONS IN ITALY.

By ARTHUR L. FROTHINGHAM, JR.

This lecture was for the purpose of presenting to the Philadelphians the first part

of a series of antiquities excavated in Italian tombs of the pre-Roman period. These antiquities are the first instalment of what it is hoped will become the largest Etruscan museum outside of Italy. During the last months of 1895, while Associate Director of the new School in Rome, I was able to secure the services of an experienced excavator, and it seemed as if the occasion were a good one to interest some American museum in the establishment of a large Etruscan collection gotten together on scientific principles and as the result mainly of excavations undertaken for the express purpose. The idea of such a museum is chiefly to secure works of art and industry illustrating the history of every section of Italy during the pre-Roman period. The contents of each tomb is to be kept together and the tombs arranged in chronological order under each locality. In this way unscientific herding in separate sections of all bronzes, all vases, all arms and jewelry, regardless of time and place is avoided, and the objects that are found together are naturally grouped likewise, thus representing the same development of art and industry and illustrating far better the life of the people. This has been heretofore done only in the case of one museum in Italy, the Etruscan Museum, outside the Popolo Gate.

After negotiations with the museums of New York and Chicago, it seemed best to accept the invitation of those interested in the new Museum of the University of Pennsylvania to establish such a museum in Philadelphia. The objects exhibited are only a part of the results of the first year's excavations. They come from quite a number of principal Etruscan sites; among these are Vulci, Narce, Caere, Tarquinii, Orvieto, Chiusi, Toscanella, Falerii, etc. The excavations are carried on under great difficulties. It is perhaps not generally understood that very often fifty tombs may be opened one after

the other without a single object being found in them. This is especially the case with the rich chamber-tombs of a developed period, the despoiling of which commenced during the Roman period and has continued ever since. The demands of the large land-owners on whose property the ancient sites are situated are often so exorbitant as to make an excavation impossible, and even when this difficulty has been overcome it is sometimes impossible to obtain a government permit for excavation owing to the desire of certain men in the Department of Antiquities of the Italian Ministry to have a monopoly of discoveries and especially to exclude the investigations of foreigners, even if the discoveries are put off a century or the sites ruined by the havoc of clandestine pillagers. The necropoli of many of the ancient cities have not yet even been located and often, even when all other obstacles have been overcome, it is necessary to spend a great deal of time in fixing exactly on the site to be excavated, as it is only seldom that there are evident signs above ground of the position of the tombs. Even when tombs are found that have not been previously opened, in ninety-nine cases out of a hundred the tomb has fallen in and the majority of the objects have been crushed, and even when the pieces are saved, the restoration takes many weeks owing to the dearth of clever restorers.

The period illustrated by the antiquities on exhibition covers almost the entire development of early Italian antiquities from the x century B. C. down to the II century B. C. But it is the early part of this period which is here the most fully illustrated—the first three or four centuries of the pre-historic age.

The series of Villanova cinerary urns, which formed the principal contents of the early well-tombs, is perhaps the finest yet made, with the exception of the series in the museum at Bologna. The tombs

of the VIII century from Narce are especially numerous. They are trench-tombs which show for the first time the influence of imported objects from the Orient. The most interesting is the tomb of a warrior which contains a helmet and breastplate which will become famous when illustrated. The same tomb has the bits and the bronze ornaments of the harness of the warrior's chariot horses. From tombs of this period there are a number of pieces of very early gold jewelry. Among the earliest that have been found is a gold fibula especially interesting. The greater part of the tombs of the IX, VIII and VII centuries were found in a necropolis which is called by the modern name of Narce, the ancient name of the city having been lost. This city, which must have attained to great importance at an early period, appears to have been abandoned in the V or VI centuries B. C. Its necropolis is richer in monuments of the three centuries before this time than any other yet discovered in Italy. It has contributed about half its contents to the Etruscan Museum in Rome and, even after yielding a further harvest of almost as great an extent for America, it still seems not to be exhausted.

There was one necropolis which, if excavated, would give a more complete history of old Italian civilization than perhaps any other—that is the necropolis of Bizontium. An excursion which I made to this necropolis showed that it begins on a tongue of land running out into the lake, at the base of the prominence on which the ancient city was erected, and extends over the rolling country and the hills to the west and south. There were several kilometers of tombs, beginning with the extremely archaic and rude well tombs of about the X century B. C., near the water, passing through the period of rich well-tombs of the VIII and VII centuries on to the rock-cut chamber tombs of the V, IV and III centuries and ending in the colum-

baria of the Roman period. It was only the impossible conditions laid down by the owner of the land, who has in his possession the entire site of the city and necropolis, that prevented an excavation being attempted which would certainly have been easy and fruitful owing to the fact that the tombs are dug but little below the surface of the ground and are very easily located.

The necropolis at Chiusi is noted as being the centre for the manufacture of the most characteristic Etruscan ware of the middle period, called *bucchero* ware, the majority of which is black. There is no style in pottery which is more varied in its form and ornamentation than the black *bucchero*, and in it the Etruscans exhibit, more than anywhere else, the peculiar fantastic character of their art. Among the most important pieces of *bucchero* exhibited was a large temple urn with two rows of small figurines placed as mourners around the top of the urn cover, which was surmounted by a large figure, probably representing the deceased, standing with its right hand raised. From Chiusi also come three sacrificial fire-trays with their accompanying vases and utensils;—one of them in black *bucchero* and the other two of bronze resting on wheels. The bronze trays are extremely rare. A series of terracotta antefixes from a temple at Corneto (Tarquinii) illustrates the different styles of decoration of an Etruscan temple during a period of four or five hundred years. The temples being built of wood were very often burned and restored and these antefixes belonged to different periods of construction and reconstruction. The earliest, which seem to follow Egyptian models, belong to the early part of the VI century. Then comes a series in which this type is modified so as to approach more closely to the Greek-archaic type of female head. Then follow some groups and heads of the IV century

and finally, some heads of satyrs of rather brutal classic features which show the style of the III century.

Excavations are being continued,—through the generosity of Mr. Wanamaker,—on a number of ancient sites, and a large amount of archaeological material will shortly be added to that already accumulated in Philadelphia.

Summary of a lecture delivered before the Archaeological Society, at the Philadelphia Museum, on March 30, 1897.

A MODERN VIEW OF ANCIENT ROME.

By ARTHUR L. FROTHINGHAM, Jr.

The excavations during the past twenty-five years in the region north and south of Rome have enabled us, for the first time, to form some adequate idea of Italian civilization at the time of the foundation of Rome in the middle of the VIII century B. C. Until lately we have been obliged to rely entirely on somewhat fabulous literary records.

A considerable series of cities and their necropoli have been more or less thoroughly excavated in Etruria, and in a number of cases monuments have been found dating from the X to the VI centuries B. C. We can now form a collection of comparative ground-plans of rectangular Etruscan cities, on the one hand, and circular and oval Pelasgic cities on the other, by which to control the statements of authorities in regard to the ground-plan of Rome—the *Roma quadrata* of Romulus and the larger circuit of the Servian city. A few tombs, found in the primitive Roman necropolis on the Esquiline are sufficient to show the closest connection with the contemporary civilizations of the primitive Italian races both in Latium and Etruria, to whatever race they may have belonged.

The perishable nature of most of the monuments of Rome which were earlier

than the last century of the republic, is the principal reason for their almost complete disappearance. Only some few works of engineering and practical architecture remain. The early temples and theatres and other public monuments built of wood were succeeded by imperial monuments of stone, brick, concrete and marble. Therefore, ancient Rome as we can now study it is in reality only the Rome of the empire—the Rome of Augustus modified mainly by the emperors of the I and II centuries. It is curious that until recently the line of the walls of the Emperor Aurelian marked about the limits of the modern city. Only at a few points do the modern quarters protrude beyond it.

But there are almost as many monuments of the early Christian period in Rome as there are of imperial times. The building and decorating crazes of the IV and IX centuries signaled the beginning and the end of this period. For the third time Rome became an artistic centre, and at no time since the reign of Constantine was Rome so artistically active as during the XII and XIII centuries, when the Roman school of artists led the revival of art in Italy, and when hundreds of churches in Rome itself and a multitude of churches and monasteries throughout the entire States of the Church were erected and decorated in a style invented and developed by this School and inspired from Roman and early Christian models in architecture and Mohammedan models in decoration.

The desertion of Rome by the Popes in favor of Avignon as a residence brought to a close the independent development of art in Rome. When, more than a century afterwards, Rome began to feel the influence of the Renaissance, its artistic traditions had been so completely broken that it was able to take only a passive share. The Popes, as patrons of art, filled the city with works of Tuscan, Lombard and Venetian artists, but hardly a Roman attained to even second rank among artists during the XV and XVI centuries. If anything is characteristic of Rome at this period, however, it is the imitations on a small scale of the church of St. Peter that are scattered over the entire city.

The Rome of to-day is compounded of all these elements. Its population only in a small degree retains traditions of the past, and this element is kept alive mainly by the influx of picturesque inhabitants from the mountain towns to the east and south. The Rome of the years before 1870, when it was annexed to the kingdom of Italy, has almost entirely disappeared. The city has been barbariously made over, its ancient quarters destroyed, its hills, as far as possible, levelled. The new streets are of a hideously cheap, modern architecture and unrelieved by any variations in style, except now and then by a colossal public building erected with reckless extravagance by a bankrupt government.

[Summary of a lecture delivered at the Peabody Institute in Baltimore, December, 1896.]

ABSTRACTS OF PAPERS PUBLISHED.

THE OSTEOLOGY OF HYRACODON.

By W. B. SCOTT.

Hyracodon is one of the many genera of fossil mammals which have long been incompletely known, and only very lately

has sufficient material been obtained to permit a satisfactory restoration of this remarkable animal. In the summer of 1895 Mr. J. W. Gidley collected for the Princeton Museum some unusually fine specimens of *Hyracodon*, including one

fairly complete skeleton, upon which the following account is founded. The genus is exclusively North American, and is confined, so far as is yet known, to the White River Oligocene beds.

The Rhinoceros family flourished exceedingly in North America during the Tertiary period, and became highly diversified and adapted to very different habits of life. No less than three very distinct lines or series may be distinguished among the American rhinoceroses. One of these series is represented by the White River genus *Cænopus* and its Loup Fork successor, *Aphelops*, animals much like the heavy and massive rhinoceroses of the Old World. A second series culminates in the remarkable *Metamynodon* of the White River, an animal which was doubtless aquatic, and which in many respects bore a superficial resemblance to the hippopotamus. The European *Cudurotherium* would seem to be a member of this series. Still a third line is that which terminates in *Hyracodon*, and though unmistakably belonging to the rhinoceros family, these animals deviate in very marked fashion from the other representatives of the family.

The dentition is peculiar; the molars and premolars are rhinocerotie in character, and differ from those of the other members of the family only in minor details. The incisors and canines, on the other hand, are quite different; they are present in unreduced numbers, and are all small, simple and conical; while in the true rhinoceroses the incisors are much reduced and the lower canines are enlarged and become procumbent in position. The skull is also rhinocerotie in structure, but retains many primitive characters which are not found in the contemporary representatives of the other two series. The neck is long, the cervical vertebrae being long and light in construction and with many resemblances to

those of the horse, to which they bear, superficially, a greater resemblance than to those of other rhinoceroses. The vertebrae of the trunk are also light, and those of the thoracic series have curiously elongate and slender spines, while in the lumbar region the neural spines are lower and broader. Little is known of the tail, but it would seem to have been rather short.

It is in the limbs that we find the widest departures from the ordinary type of rhinocerotie structure, departures which tend to fit the animal for a high degree of swiftness in running. Being entirely devoid of horns and other weapons of attack or defence, *Hyracodon* could have found safety from its carnivorous enemies only in superior speed.

The scapula is high and narrow; the humerus, and especially the ulna and radius, are long and slender, in very marked contrast to the short and heavy bones of the typical rhinoceros. The fore-foot has three digits, the second, third and fourth, and a small nodule representing a rudiment of the fifth metacarpal. The carpus is very narrow and the whole foot long and slender, with many resemblances to that of the contemporary three-toed horse, *Mesohippus*. The lateral digits are much more reduced than in other rhinoceroses and have slender, pointed hoofs. The pelvis is long and narrow, not having the strangely everted iliac plates, which in the other series of the family, and especially in the modern species, are conspicuously developed. The femur is long, the tibia somewhat shorter and stouter than the radius, and the hind-foot slender and elongate, like the fore foot. In the hind-foot may be observed many points of resemblance to the foot of *Mesohippus*.

In short, *Hyracodon* was a lightly-built, hornless, long-necked and long-limbed cursorial rhinoceros, which in consequence of a similarity of habits, had acquired

several resemblances to the three-toed horses. Had the line persisted it would probably, like the horses, have culminated in monodactyl forms.

The phylogenetic descent of *Hyracodon* was very probably from the Uinta genus *Triplopus*, and this perhaps from the Bridger *Hyrachyus*. The study of this series shows that many of the structural resemblances between *Hyracodon* and its contemporaries of the other rhinocerotid lines (e. g. *Canopus*) were due to parallelism of development and were independently acquired in the different lines, while many convergences toward the horses may also be observed.

*Ueber die Osteologie von *Hyracodon nebrascense* Leidy. in Festschrift für Gegenbaur. Leipzig, 1896,

ON "BIPOLARITY" IN THE GEOGRAPHIC DISTRIBUTION OF MARINE ANIMALS.

By ARNOLD E. ORTMANN.

It has been alleged that it is a peculiar feature of the antarctic marine fauna that a closer relation exists among them to the fauna of the arctic seas than to any other fauna; especially as contrasted with those of the tropical oceans. This question has been discussed lately by Pfeffer* and J. Murray,† and both agree in explaining this prevailing "bipolarity" in the distribution of polar animals by a theory which seems to me hardly tenable.

According to Pfeffer and Murray, before the beginning (in the Tertiary period) of a climatic differentiation of the seas near both poles, there existed a marine fauna, which was distributed over nearly all the world: it was a tropic-universal fauna. After the introduction of climatic changes certain elements of this universal fauna

were separated at both poles, namely those forms which adapted themselves to the climatic changes. Thus at both the South and the North Pole a fauna resulted which was derived from the same ancestors. Both polar faunas have remained more closely allied to each other, "since the metabolism in a water of low temperature was less rapid," while the tropical relations changed more rapidly, or were destroyed by the struggle for existence which was more lively within the tropics.

I think, however, it is not correct to introduce the supposition that the transforming powers in animal life have been reduced by the lower temperature of the poles. On the contrary, it is very probable that even the successive decrease of temperature caused a more energetic change of the respective animals, since the cooling was a gradual one, and the animals now living near the poles must have undergone considerable and continuous changes in order to keep pace with the changing conditions of temperature. During the history of the earth the poles have been submitted to far greater changes in climate than the tropical parts, where the climate is still nearly the same as it was in pretertiary times.

Thus the climatic changes of the poles must have effected a differentiation of the polar animals from those living within the tropics. Each polar fauna must have developed separately, since they are isolated from each other by the circumtropical belt, and if there are any polar forms which resemble each other very closely, we are compelled to make an additional supposition, namely, that their tropical ancestors have been destroyed. This destruction of tropical ancestors, or, we should say, of the connecting forms, which are the direct descendants of the ancestral form remaining nearly unchanged in the tropics, cannot be due directly to differentiation in the climate of the earth. The restriction of the tropical climate to a narrower zone

*Pfeffer, Versuch über die erdgeschichtliche Entwicklung der jetzigen Verbreitungsverhältnisse unserer Thierwelt. 1891. p. 38 and 39.

†J. Murray, On the deep and shallow-water marine fauna of the Kerguelen-Regions of the Great Southern Ocean, in: Trans. Roy. Soc. Edinburgh. Vol. 38, part 2, 1896, p. 494.

than before could hardly act in a manner to exterminate tropical animals. But other destructive powers may have operated independently on the climate, as for instance, topographically or biologically, thus producing unfavorable conditions of life. Even conditions of this kind may have changed some tropical animals in a more considerable degree than is seen in their polar relatives, but it is well to remember, that in both cases the differentiation of climate is not the cause of the close relation of both polar faunas. With this accessory supposition we might grant the possibility of the Pfeffer-Murray theory, and in this sense we may say, that a resemblance of both polar faunas is due to the original separation of the same animals from the same original stock by incipient climatic differentiation, in so far as this "bipolarity" may be looked upon as due to the conditions of former times, as a *survival* from the universal distribution prevailing before the beginning of the Tertiary period. "Bipolarity" is not a necessary result of the differentiation of climate, but it may be realized under certain additional conditions.

If we thus admit the correctness of the Pfeffer-Murray theory in the sense just set forth, we should further investigate, whether this theory is confirmed by actual facts. In this respect I wish to say that no researches have been made up to the present time as far as I know, as to whether any cases of the actual distribution of animals can really be explained by this theory, and whether they are really cases of survivals from older times.

I have, however, endeavored to apply this theory to the distribution of a particular group of marine animals, namely on the Decapod-Crustaceans, and I have found 1) that the supposed "bipolarity" is an extremely rare distributional feature, and 2) that the few cases, which might be called "bipolar" can be explained in other ways.

Pfeffer as well as Murray have given lists of southern polar animals, which apparently contain quite a number of bipolar forms. But looking over these lists the position of most of those alleged bipolar forms cannot be maintained in the face of careful criticism. Besides, Murray considered mainly such animals as live in considerable depths, and accordingly should be classed among the abyssal forms, and therefore are not at all influenced by the temperature-zones of the superficial strata of the oceans. It is a well known fact that in the abyssal depths of the sea nearly uniform temperature-conditions prevail and no distributional regions can be distinguished. Further it is known that, as a consequence of this peculiarity, many of the abyssal species are distributed all over the world. Murray, indeed, does not believe that this general distribution of deep-sea animals is confirmed by the results of the Challenger-expedition, but in this respect he is certainly mistaken. From the Challenger-expedition we got the first indications of this rule among deep-sea animals, and it is amply confirmed by later investigations, especially of the North-American and East-Indian surveys. Thus it is entirely unwarranted to rely, as Murray does, upon certain deep-sea animals, which seem to be distributed only in both polar seas. The few cases recorded by Murray are to be looked upon as illustrations of the deficiency of our knowledge, since any deep-sea species only found up to the present time north and south of the tropics *must* also be present within the tropics, but it has not yet been found there. This supposition is the more probable, since investigations of the deep-sea are too few in number and cover only very limited parts of the oceans to a tolerably complete degree.

Thus, disregarding all the true abyssal animals, we should examine only the lists of litoral animals given by Pfeffer and

Murray. In reviewing these lists we find that, among the Decapods, not a single species is recorded that shows what is called "bipolarity." But some antarctic species are recorded, which seem to be closely related to arctic ones, thus constituting examples of bipolarity of genera: the most remarkable of them are represented by species of the genera: *Hippolyte*, *Pandalus*, *Crangon*, *Munida*, and *Lithodes*.

Out of these genera, however, *Hippolyte* and *Munida* should be omitted, since both also possess litoral representatives within the tropics. Among the remaining three, to which I would add two others, *Pontophilus* and *Cancer*, we may properly distinguish two groups.

To the first group belong *Pontophilus* and *Pandalus*, and although the latter is very incompletely known systematically, we may at present assume that it shows the same peculiarities as *Pontophilus*, namely, that litoral species are known only from the temperate and frigid shores in both the northern and southern hemispheres, while within the tropics none are present. But, on the other hand, there are in both genera numerous abyssal species, some of which show the characteristic world-wide distribution of deep-sea forms. This fact induces me to suppose that these genera have originated within the litoral region of one of the polar areas, and then have descended into the deep-sea. There they have spread over the bottom of the oceans, have crossed the tropics, and reascended into the litoral of the other hemisphere. Therefore only the litoral species of *Pontophilus* and *Pandalus* can be considered "bipolar," since a connection of both ranges is present through the deep-sea; and the horizontal distribution of these genera becomes a continuous one. These genera cannot be properly ranged with the bipolar ones, and the apparent bipolarity of their litoral species is due to a secondary migration from pole to pole through

the deep-sea, and has nothing to do with the differentiation of climates in the oceans.

The second group is formed by the genera *Lithodes* and *Cancer*, and probably *Crangon* belongs also to this group. Of *Lithodes*, which is claimed as a bipolar genus by Murray, it is well known that its range comprises not only the northern and southern polar seas, but that it also extends from the northern Pacific Ocean into the southern all along the western coast of America. The same is the case of *Cancer*, which is not mentioned either by Pfeffer or Murray. Along the western coast of America (and also probably along the western coast of Africa) peculiar conditions of temperature prevail within the litoral waters: there are, even within the tropics, comparatively low temperatures, and therefore it is not surprising that polar animals should be able to cross the tropics by way of this portion of the litoral regions and, indeed, there are numerous instances known, where species or genera range from California to Chili. But most of the latter are confined to the West American shores, and do not attain a larger distribution, reaching nearer the poles. *Lithodes* and *Cancer*, however, are widely distributed in the cooler seas of both hemispheres; they are wholly wanting in the true tropics, *i. e.*, in the seas of tropical temperature; but their range crosses the tropics, and the northern and southern species are connected topographically by species living on the western shores of America in the litoral regions of lower latitudes, even under the equator, where a cooler temperature than usual prevails. Thus we have here a second pathway, which might have induced some genera to migrate from one hemisphere to the other, and this passage is afforded by the low temperatures of the shore-waters of West-America and West-Africa.

There remains only the genus *Crangon* to speak of. This genus is a true bipolar

one according to our present knowledge, but I think it should be classed with *Lithodes* and *Cancer*. Although no species are known from the western coasts of America (from Mexico to Chili) or from the tropical West-African coast, the two antarctic species, one from South-Georgia, the other from the Cape of Good Hope, show peculiar relations to arctic species, namely, the South-Georgian species is closely allied to a Californian, the South-African to the common European species. This affinity would be well explained by the assumption, that both reached their present localities by migration along the western coasts of the respective continents. No remaining stations are left on these coasts, as far as we know: the former connection along these coasts has been completely interrupted by causes unknown, and thus the genus *Crangon* has become a true "bipolar" one. But even this bipolarity is not connected with the original differentiation of climates, but it is a secondary one, due, from the reasons just set forth, to a later migration from the northern to the southern hemisphere along the western coasts of America or Africa.

Thus we may safely say that a close investigation of the distributional features of the Decapod-Crustaceans proves, that "bipolar" species are entirely wanting, and that cases of "bipolarity" of genera are extremely rare. No case can be explained by the Pfeffer-Murray theory, and the only case of true bipolarity of a genus (*Crangon*) is to be best explained by secondary migration along the western coasts of the continents across the tropics. In all other instances, where bipolarity of a genus has been alleged, an actual connection of both polar ranges is still present, and this connection lies either along the western coasts of the continents or in the deep-sea. Both ways are still open for a migration of the polar faunas across the tropics, but the fact, that only a few groups have availed

themselves of these paths, suggests that in both pathways important topographical barriers are present against such dispersal taking place, although the climatic conditions of both the deep-sea and the shore waters of the western continental borders are in a certain degree similar to those prevailing in the northern and southern parts of the litoral regions.

It is very probable, that "bipolarity" in other marine animals is to be regarded from the same standpoint as established here for the Decapod-Crustaceans. It must however be remarked, that only a careful systematic study as well as a review of the natural affinities of each group can give us a proper basis for zoogeographical research in this line, and it is utterly impossible to get an appropriate idea of bipolarity by a mere superficial knowledge both of the faunistic peculiarities of the polar regions and of the systematic relations of the respective species. There are cases known, where antarctic species superficially resemble arctic species, but where this external resemblance is due to "convergency" and not to a genetic connection.

[Summary of a paper published in *Zoologische Jahrbücher* IX, 1896, p. 57-55.]

THE EXTINCT FELIDÆ OF NORTH AMERICA.

By GEO. I. ADAMS.

In this paper the author purposes to summarize the literature on the extinct Felidæ, to add such new points of knowledge as it has been possible to discover by the study of new and more complete material, and to propose a new classification for the family.

Mr. Adams sub-divides the Felidæ into the two following sub-families: (1) Machærodontinæ—the sabre-toothed cats. (2) Felinæ—the true cats.

The sabre-toothed cats are distinguished by their huge sabre-like superior canines which project far below the skull. The

lower border of the mandible is produced into a flange which protects the canine from lateral blows. These huge tusk-like teeth and powerful limbs seem to have fitted them far better than any of the other Carnivora for destructive efficiency and the cause of their extinction is impossible to conjecture.

The sabre-teeth have a continuous history from the Bridger to the Pleistocene when they die out without leaving any descendants.

In our Bridger Eocene the form *Elurotherium leidyianum*, Adams probably represents the ancestor of the Machærodontinæ. Already in the White River times the line had undergone considerable modification and we find the three genera *Hoplophoneus*, *Dinictis* and *Eusmilus*. *Hoplophoneus primævus* which may be taken as a type of the sabre-teeth is comparable in size to the lynx, although it has a much longer head, and the distal segments of the limbs are relatively shorter. The skull is very heavy and massive, the bones forming its walls are thicker and all the processes for muscular attachments are better developed than in the lynx. The superior canines are long, compressed and slightly recurved, and have a denticulate anterior border. The limb bones are proportionately much stouter and more massive than those of the lynx which indicates that the sabre-teeth were less agile than existing cats although much more muscular.

Dinictis and *Eusmilus* are a little off the line of descent of the Machærodontinæ and differ in detail from *Hoplophoneus*.

The line leads up to *Machærodus* in the Pliocene, which was almost as large as a lion and had huge tusk-like canines nearly a foot in length. Its huge teeth and powerful limbs seem to have fitted it far better than other members of the Felidæ for its purpose in the economy of nature, yet ordinary cat-like animals of the genus

Felis were contemporary with it and have survived it since *Machærodus* disappears in the Post-Pliocene though in early periods it had been widely distributed on both continents.

Our information concerning the early history of the true cats is very meagre. *Felis* first occurs in the Miocene deposits of Sansan in Europe, the equivalent of our Loup Fork and from this up to the present time their history is continuous and well known.

[Mr. Adams' paper (of which this is a summary) was published in "*The American Journal of Science*," Vol. 1, June, 1896.]

NOTES ON THE OSTEOLOGY OF THE WHITE RIVER HORSES.

By MARCUS S. FARR.

This paper is an attempt to trace the steps in the evolution of the horse as they can be followed in the different horizons of the White River strata. *Meshippus bairdi* is taken as a standard for comparison, the essential points of its osteology are reviewed and some new points of interest are brought out. The possession of a distinct acromion process on the scapula is remarkable, and in this character it is unique among Oligocene Perissodactyls. *Orohippus* of the Bridger Eocene is the only other odd-toed ungulate known to have possessed it. *M. bairdi* presents the following advances over its Bridger ancestor:

(1.) Teeth are longer, and more complex, the intermediate cusps are better developed, as are also the transverse crests, which are more nearly confluent with outer wall of tooth.

(2.) The lateral metapodials are comparatively more reduced and metapodial III is much larger. The Bridger form retains the phalanges of digit V, but these are lost in *M. bairdi* and the digit is represented only by a rudimentary metapodial.

(3.) Both the ulna and fibula are more reduced than in the earlier form.

(4.) In *M. bairdi*, Premolars 2-4 are molariform while in the Bridger genus only the fourth premolar has this complex character. In *M. bairdi* the two outer pairs of incisors, Is. 2-3, show a distinct enamel invagination or pit.

Meshippus intermedius which, as the name indicates, stands intermediate between *M. bairdi* and the form occurring in the overlying John Day beds which Cope has called *Anchitherium praestans*, but which does not present any characters sufficient to separate it generically from *Meshippus*. *M. intermedius* occurs in the Protoceras beds, the uppermost division of the strata of the White River formation, and presents the following differences from *M. bairdi* which must be looked upon as modernizations:

(1.) Increase in size and general proportions.

(2.) All the incisors are now pitted.

(3.) The facial region of the skull is more elongate and the orbit is shifted farther backward. In *M. bairdi* it is directly over the first molar while in *M. intermedius* it is over the interval between molars 2 and 3.

(4.) The diastema between the canine and the first premolar is proportionately greater in the larger species. The molar teeth are much larger, longer and more specialized than those of *M. bairdi*.

(5.) The orbit is more nearly enclosed by the longer post-orbital process of the frontal.

These specializations are all in the direction of the modern horse and there can be no doubt that the two species stand in the direct relation of ancestor and descendant, and represent the main line of equine descent during Oligocene times. In the lowest strata *M. bairdi* represents the main line and gives rise to *M. intermedius* which continues the series during the era of the Protoceras beds while the former still persists, but now as a side line. *M. intermedius* leads directly to the John Day form. *Meshippus copei* is an aberrant member of the equine stem and is the giant of the White River horses. It resembles *M. bairdi* in most of the essential points of its structure and yet is too specialized in its own way to be ancestral to any of the later members of the equine stem, though most probably derived from the former species. It first occurs in the Upper Oreodon beds and is represented in the Protoceras beds by larger individuals.

The phylogeny of the horses is probably better understood than that of any other family and we now have their complete history from *Hyracotherium* of the Wasatch to *Equus* which first occurs in the Pliocene.

[The paper of which this is a resumé was published in *Proc. Amer. Phil. Soc.*, Vol. XXXV, pp. 147-175.]

REVIEWS OF BOOKS.

"THE STUDENT'S DICTIONARY OF ANGLO-SAXON." By Henry Sweet, Ph.D., Macmillan Co., London and New York, 1897.

Down to a comparatively recent date, the only inexpensive and convenient Old English Lexicon for general use has been Bosworth's Edition of 1838, now in process of revision and enlargement by Professor

Toller, of Manchester, under the title—"The Bosworth-Toller Dictionary." This edition, in its contemplated comprehensiveness and consequent expense, sustains the same relation to other Old English Lexicons which the Century Dictionary sustains to other English Dictionaries.

Hence, the need has long been felt of what Doctor Bosworth aimed to supply—"a cheap and useful manual," and one covering the province both of prose and verse. Harrison and Baskervill's "Anglo-Saxon Dictionary," based on Groschopp's Grein, is confined to Old English poetry, and within that special sphere has met an urgent need. It is called "a Handy Dictionary," and so it is. Dictionaries issued in connection with special texts such as Harrison and Sharp's "Beowulf," Kent's "Elene" and Cook's "Judith," have their appropriate place, but do not meet the more general need. To meet this larger need two dictionaries have recently appeared. They are:

Doctor Clark Hall's "Students Anglo-Saxon Dictionary," 1894, and Doctor Sweet's edition now before us, "The Student's Dictionary of Anglo-Saxon." The similarity of their titles naturally combines them in the view of the critic.

Each of them has been prepared in the light of the fact that all preceding dictionaries fail to meet the existing need. Hall speaks of them as "incomplete," and Sweet calls them "antiquated," special reference being made to Bosworth, Eltmüller and Leo. Each of them takes advantage of all antecedent material, making good use, as far as it has been issued, of the Bosworth-Toller edition. In fact, Sweet in his Preface, speaks of his work as "an abridgment" of this elaborate revision, while he does not hesitate to refer to Hall's Lexicon as "a work of great industry; containing a good deal of new and valuable matter, and of considerable service" to him in his own labours. It should also be added, that Doctor Sweet believes his own edition "to be the most trustworthy Anglo-Saxon Dictionary that has yet appeared."

Of the comparative merits of the two lexicons, the critic must take his own view, quite irrespective of the editors them-

selves, the matter of main importance being that they have common merits, and have been prepared to answer an immediate need.

Each of them has been issued with primary reference to their availability for students. Each of them covers the entire area of Old English texts in prose and verse. Each of them, despite all existing defects, is a scholarly production, with a clear arrangement of material; and each of them may be said to answer substantially the purpose for which it was prepared.

There are, also, imperfections common to each, such as the too frequent omission of the chief parts of verbs, of the genitive case of nouns, and insufficient textual reference. In each of these particulars, the average Old English student needs a larger measure of aid from the lexicographer than is here given, while it is not wise, as we believe, for any such editor to confine the student, as Sweet has done, to the acceptance of his particular classification of verbs and other grammatical forms. The lexicon should be free from any such specific categories.

Such errors and omissions conceded, however, emphasis should be laid on the distinctive merits of the edition in hand, which, as the latest, may of right be expected to surpass all antecedent editions.

Doctor Sweet has already done distinguished service in this department by the preparation of such works as his "Anglo-Saxon Reader," "History of English Sounds," "Oldest English Texts" and similar manuals, while it is questionable whether, as yet, he has rendered a more substantial service to students of English than he has done in this latest lexicon.

With this and Doctor Hall's volume in hand, and the various editions of Old English authors recently issued in Europe and America, there is no good reason why our college students should not now become

thoroughly conversant with our oldest English, both on its linguistic and literary side, and thus secure a broader and more scientific view of English in its entirety. The increasing interest evinced in these directions is one of the promising signs of the times.

T. W. HUNT.

PRINCETON MORPHOLOGICAL STUDIES. Collected for the Sesquicentennial Celebration of the founding of the University. By Henry Fairfield Osborn, former Professor of Comparative Anatomy, Princeton. Vol. I, No. 1, 1883-1892. The Princeton Press. Oct., 1896.

The above is the title of a collection of eleven papers which embody the results of work done in the Biological Laboratory of Princeton from the year 1883 to 1892 inclusive. During this period Prof. Henry Fairfield Osborn, now of Columbia University, was Professor of Comparative Anatomy at Princeton; and not only is the editing of the present volume, as well as the text of several of the papers it contains, due to him, but also the greater part of the remaining papers, written by his own post-graduate students at Princeton.

The list of contributors to the volume is as follows:

W. B. Scott, Ph.D., Professor of Geology and Paleontology, Princeton University, Princeton. One paper.

Henry Orr, Ph.D., Professor of Biology, Tulane University, New Orleans. Two papers.

Charles F. W. McClure, Assistant Professor of Biology, Princeton University, Princeton. One paper.

Bertram H. Waters, M.D., Presbyterian Hospital (1893-94,) New York. One paper.

Isaac Nakagawa, B.Sc., Bacteriological Institute, Tokio, Japan. One paper.

Henry Fairfield Osborn, Sc.D., Da Costa Professor of Zoölogy, Columbia University, New York. Five papers.

The eleven papers, with the accompanying plates, which form the volume were collected from the journals in which they originally appeared. Six of the papers were first published in the "Journal of Morphology," three in the "Quarterly Journal of Microscopical Science," and two in the "Proceedings of the Academy of Natural Sciences of Philadelphia."

The collection forms a valuable contribution to our knowledge of the structure and development of the nervous system. Six of the papers, by Osborn, McClure, Nakagawa and Waters, deal exclusively with the brain and its development, while the others, touching in part on the nervous system, are embryological treatises on several of the lower vertebrate forms.

It is not alone, however, the importance of the papers themselves that makes this volume noteworthy, but we possess in it an evidence of the good work being done by Princeton's Instructors and Graduate students. Appearing at this important period in the history of the University, it forms, as the title page suggests, a memorial of the Sesquicentennial Celebration; and we welcome it at this time as a proof of the continued interest of one of Princeton's former professors in his *Alma Mater* and as a graceful tribute to her at this beginning of her University career.

W. M. RANKIN.

SELECTIONS FROM BURKE. Edited by Professor Bliss Perry of Princeton University. XXVI+298 pp. Henry Holt & Co. 60 cents.

The latest volume in Henry Holt & Co.'s series of English Readings is Professor Perry's *Selections from Burke*. Wherever it was possible, complete productions have been chosen, and when the limitations of space have not allowed this, only such passages have been presented as have a certain unity of their own, apart from the context. The selections are chronological

in their order, and are designed to give the student as clear a conception as may be of Burke himself, from the beginning to the close of his career. For instance, the volume contains five complete utterances of Burke at the time of the contest with America, and these five productions, taken together, give a more varied and complete view of Burke's relation to the American question than can be found, it is thought, in any equal number of pages from his writings. It has been impossible to print here more than a few pages out of the two thousand that Burke devoted to India, but we have the famous passage from *The*

Nabob of Arcot's Debts and the Charge and Peroration in the Hastings trial. The *Reflections on the French Revolution* is represented by seven passages, which were recognized at the first appearance of the book as containing its essential doctrines, and which have gained rather than lost in interest as the democratic movement has spread more and more widely in society. The brilliant *Letter to a Noble Lord*, written in the last year but one of Burke's life, is an apologia for his whole career, and furnishes a fitting close to these selections.

NOTES.

LAURENCE HUTTON'S COLLECTION OF DEATH MASKS.

We take the following from the New York *Sun* of March 8:

Everybody interested in such things knows of the collection of death masks which Laurence Hutton, editor of *Harper's Magazine*, has spent the better part of forty years in getting together. The collection is the largest and finest in the world, and the only one, in fact, that may be dignified by the term collection.

It has been kept in Mr. Hutton's study, on the second floor of his residence, 229 West Thirty-fourth street, and among these "portraits in plaster" of famous men of this and other countries Mr. Hutton has lived and worked for over a quarter of a century. Knowing this, his friends were surprised yesterday to read in the papers that he had given the entire collection to Princeton University. They wondered why.

"You see, it was this way," Mr. Hutton said yesterday to a *Sun* reporter: "They have had me down at Princeton a good deal to talk books and literature and such

like to the boys down there. Not long ago I was informed that the Board of Trustees, at its last meeting, had voted to confer upon me the degree of Master of Arts at the Commencement. According to my notion, that made me a Princeton man, gave me the right to wear Princeton colors and yell the Princeton yell, and I thought I'd like to do something for the University. When I was down there a while ago somebody asked me what I was going to do with my collection. I wanted the room it took up in my study, and so I said that I would give it to Princeton, provided a room in the new library was set aside for it. The room was readily obtained, and when it's ready the collection will go down there."

Although much has been written about this collection of death masks, the story of how many of the masks came into Mr. Hutton's possession has never been told. There are between sixty and seventy of the masks, and each has its story. The collection of these stories would fill a volume. In the collection are the masks of Napoleon, Washington, Lincoln, Thackeray, Daniel Webster, Queen Elizabeth,

Dean Swift, Coleridge, Laurence Sterne, Keats, Prof. Richard Owen, Richard Brinsley Sheridan, Sir Isaac Newton, Dion Boucicault, John McCullough, Gen. Sherman, Harry Edwards, Lawrence Barrett, Mary Queen of Scots, Henry Clay, John C. Calhoun, Edmund Burke, Sir Thomas More, Oliver Cromwell, Aaron Burr, Edmund Kean, David Garrick, Frederick the Great, Robespierre, Murat, Mirabeau, Beethoven, Mendelssohn, Haydn, Wordsworth, Charles II., Napoleon III., Goethe, Luther, Dante, Franklin, Edwin Booth, Pope Pius IX., Sir Walter Scott, Tasso, Mrs. Scott Siddons, Louise of Prussia, Schiller, Curran, Count Cavour, Disraeli, Tom Paine, and Lord Palmerston.

Mr. Hutton became interested in death masks early in the sixties, when he was a clerk in a New York store. One afternoon in a book store he saw a mask of Benjamin Franklin found in an ash barrel on Second Street near Second Avenue and on exploring the ash barrel Mr. Hutton found another mask of Franklin, one of Wordsworth, one of Scott, and one of Cromwell, and casts from the skulls of Robert Bruce (as supposed), and Robert Burns. With these Mr. Hutton's collection was begun.

The mask of Dean Swift is the only one in existence. It was originally the property of Trinity College, Dublin. From the library of the college it was stolen about 1853. A large reward was offered for its return, but nothing was ever heard of the mask. A few years ago Mr. Hutton was rummaging in an old curiosity shop in London and he came across the mask of Swift under a pile of rubbish.

Some question has been raised as to the genuineness of the cast of Robert Bruce's skull. Bruce died just outside the Holy Land. It is a twice-told tale that he directed, before his death, that if he did

not live to reach Palestine he wanted his heart carried there. When, some fifty years ago, Queen Victoria caused the grave of Bruce to be opened that a cast might be made from his skull, it was found that several ribs on the left side of the body over the heart were missing, and that was taken as an identification of the body.

The mask of Sir Isaac Newton is one of two in existence. The original, by Roubilliac, is in the rooms of the Royal Society, at Burlington House, London. He made two masks instead of one. On his death his business was left to his son, and there was a clause in the old man's will, calling attention to the fact that among the testator's effects would be found a death mask of Sir Isaac Newton, and that it was a mate to the one in the rooms of the Royal Society. The son still carries on the business in London, and it was from him that Mr. Hutton purchased the mask. It is considered the most valuable mask in the collection.

For some time there was a little doubt as to whether Mr. Hutton's mask of Coleridge is genuine. The question has now been settled in the affirmative. Mr. Hutton spent a year or two in going over the private records of the Coleridge family, in which, on several occasions, he was assisted by Mr. Ernest Hartley Coleridge, grandson of the poet.

Evidence showing when the mask was taken was found, and then another proof was discovered. The ear on Mr. Hutton's mask is about one inch higher than the human ear should be. This is a marking borne by every member of the Coleridge family, and is borne even by Mr. Ernest Coleridge. This last proof of the genuineness of the mask was considered convincing.

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